

High Voltage Testing with AC Power Frequency

High Voltage, Inc. is a small design and manufacturing company located in the Hudson Valley region of New York State. Although small, we are a large presence in the electrical test equipment industry with a representative organization covering most of the world and a highly respected product line used in a variety of industries and applications.

PRODUCTS

Most of our products produce high voltage and can be grouped by output waveform. We offer ac and dc hipots, very low frequency ac hipots for testing shielded power cables, and capacitive discharge cable fault locators. We also produce oil breakdown testers, cable neutral integrity testers and a line of high voltage dividers that allow measurement of voltages up to 300 kV (ac and dc) with your scope or multimeter.

This article will focus on our ac hipot dielectric tester lines. This includes our PFT line of portable ac hipots, typically used for testing switchgear and other electrical apparatus. With output ratings from 10 to 100 kV ac rms and 50 / 60 Hz (the frequency you put in is what you get out). Models rated up to 50 kV have a shielded output cable. 40, 65, and 100 kV models are a two-piece design and are bus-connected to the test object, using bare wire or conductive pipe. Model PFT-503CM is rated 0 to 50 kV ac and is our most popular model, due to its single piece construction and cable output, features rare at this ac output voltage rating. It is perfect for ac testing 15 kV vacuum bottles and breakers.

“PFT” stands for power frequency tester. The next ac line, with higher output ratings, is our ALT line. “ALT” is for aerial lift tester and includes models rated 0 to 120, 210, and 300 kV ac. These sets are used for a variety of purposes but were designed for testing insulated bucket truck booms and bucket liners. Switchgear testing is another common application for these products. Model ALT-120/60 is widely used by the



ALT – 120/60

aerial lift industry and offers 0 to 120 kV for the boom test and a half-voltage, full-kVA tap that gives twice the output current up to 60 kV for the ac bucket liner test. We include a hand cart for portability and there is a 250 uA low current meter scale for precise leakage readings.

The HPA (higher powered ac) line offers output ratings up to 300 kV and power ratings up to 40 kVA. These are generally stationary or mounted on roll-around carts and are used primarily by manufacturers and rebuild shops. Special models include sets designed for breakdown testing of thin-film insulating materials per ASTM-D149 with a built-in test chamber and interchangeable test fixtures. This product line is highly customizable with different configuration and controller options.

For the highest ac power ratings, we have the new PAR line (parallel ac resonant). With only 10 or 20 kVA input you can have output voltage ratings up to 100 kV ac and power ratings up to 250 kVA. This is perfect for ac testing of large capacitive loads using Variable Inductance Parallel Resonance. A tunable reactor is adjusted to match the capacitance of the test object creating a controlled resonance that reduces input power requirements by a factor of 10 to 30 times less than a comparable ac test transformer.

APPLICATIONS

The aerial lift testing application covers the high voltage testing of any bucket truck or other lift device that includes insulation protecting the operator from high voltages. This application is covered by ANSI-92.2 and other standards. Testing may be performed with ac or dc voltage, subject to your interpretation of the standard. Some manufacturers use ac for testing new product and after any repairs involving the insulating systems (fiberglass insert, hydraulic hoses and oil). Dc is often used for routine testing in the field per ANSI standard 92.2. Our 100 kV dc hipot (PTS-100U) has become very popular for this application and has some advantages.

Model ALT-120/60 is the ac tester designed specifically for this application. With insulating systems designed for an ac operating environment, ac testing is the gold standard. The set

is a two-piece design with a 20 foot interconnect cable, keeping you safely away from danger. The yellow high voltage section must be removed from the hand cart during use. The cart serves as a convenient stand for the controls. No voltmeter probe is required as an internal divider is utilized, simplifying set up and eliminating an expensive replacement item. The load is connected via bare wire or conductive pipe, while maintaining sufficient distance from any grounded surfaces. Input on the 120 v version is a 30A circuit, required for the liner test. Customers who only test booms sometimes make an adapter for a normal 20A outlet.

The ALT-120/60 includes a guard circuit for more precise leakage current readings. A toggle switch selects ground or guard mode. In ground mode the set reads all leakage that gets to ground including any returned via the special "return" lead. In guard mode, any leakage that gets to ground is returned to the high voltage





“Our products are rugged and easy to use and have the features required by the electrical test professional.”

transformer, bypassing the panel current meter. Only current that returns via the return lead passes through the meter. For this to be effective, the low side of the insulation being tested must not be grounded, except by connection of the return lead.

Most of the products we produce including the ALT-120/60 include zero-start and external interlock safety provisions. This means that before you can energize the high voltage, the voltage-adjust knob must be returned to the zero position. The external interlock feature involves a two-prong panel socket. We provide a two-prong plug that is shorted and covered with an insulated cap. The set will operate when this plug is inserted and is disabled when the plug is removed. Place the plug in your pocket when leaving the set unattended. We also offer optional hand and foot dead-man switches that use the same socket and must be depressed before and during the test. Or cut into the provided plug and wire in any number of series-connected test-cage door, or emergency-off switches. Opening any of these switches will have the same effect as hitting “HV Off”.

The dc hipot model PTS-100U produces 0 to 100 kV dc negative and has the same guard circuit and safety features. Its advantages include lighter weight, lower cost, and it operates from a normal 120 v outlet. It also includes

a 50 foot long shielded high voltage output cable.

Personal protection equipment testing is another important application for our products, especially the PFT portable hipots. While we focus on the high voltage source, we often recommend a company called Hanco International (hanco.com) for fixturing. Hanco makes fixtures for testing hotsticks as well as dedicated machines for testing rubber gloves, sleeves, boots, blankets and other items, using our power supplies. They offer a modular hot stick testing fixture that comes in sections that add together to equal the length of your particular hot stick. They offer our 50 kV hipot, model PFT-503CM as the voltage source. See their website for more info.

Switchgear testing is probably the number one application for our power frequency ac hipots, especially the PFT line. Switchgear is not generally an extremely capacitive test load, unlike shielded power cables which have very high capacitance and must be tested using very low frequency ac, resonant ac, or dc.

High Voltage, Inc strives to have the best customer and product support in the test equipment industry. Contact us at sales@hvinc.com with any questions or application assistance. Our products are rugged and easy to use and have the features required by the electrical test professional.

PORTABLE SWITCH STICK TESTER

HANCO PF-SST-4 / 5 / 6

Portable fiberglass stick tester models are available in 4', 5' and 6' models which can interconnect to test the complete stick length, while also being able to fold to a convenient, compact size.

Portable Stick Tester may be sold by itself or as a combination unit with a 0-50KVAC High Voltage, Inc. hipot.

PFT-503CM



The **PFT-503CM / PFT-503CMF AC** hipot test set provides continuously adjustable output voltages for overvoltage withstand testing of switchgear, circuit breakers, reclosers, vacuum bottles, hot sticks, and other high voltage insulation requiring AC tests.



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